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Commencing rehabilitation in the ICU

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ABSTRACT

Rehabilitation is an integral part of the management of patients in Intensive Care Units (ICUs). The most important aim in this area is to enhance the overall patient's functional capacity and to restore his/her respiratory and physical independence, thus decreasing the risks of bed rest and associated complications.

The evidence for applying a weaning protocol and physiotherapy techniques (postures, percussion/vibration, limb exercise, and active mobilisation) in these patients has proved to be effective according to the rationale application of each process. However, to date, there are only strong recommendations concerning the evidence-based strategies to speed weaning from mechanical ventilation. Early physiotherapy may be effective in ICU: nonetheless, most techniques need to be further studied in a wider population. In particular, evidence supporting physiotherapy intervention is limited as there are no studies examining the specific effects of interventions on long-term outcomes.

***Key words**:* weaning, mechanical ventilation, chest physiotherapy.

The general aims of any physiotherapy program in the critical areas is to apply advanced, cost-effective therapeutic modalities to decrease the patient's dependency on the ventilator, to improve residual function, to prevent the need for new hospitalisations as well as to improve the patient's quality of life. In other words, the aim of this programme is to enhance the overall patient's functional capacity and to restore his/her respiratory and physical independence, thus decreasing the risks of bed-rest associated complications (1). Rehabilitation programs, when early started, help to prevent weaning delay, limited mobility and total dependence on the ventilator (2). Therefore, weaning process and physioterapy are two major and related interventions to speed up the patient's recovery.

In a recent european survey (3) important variations in the number, role and profile of respiratory physioterapist in critical care areas has been recorded. The role of physiotherapists in these areas varies considerably among different countries, depending on factors such staffing levels, training, and expertise.

The actual evidence to support the rationale and the clinical effectiveness of weaning process and physiotherapy to prevent deconditioning and complications in ICU patients is here briefly reported. Table 1 shows the list of the most applied interventions in the ICUs.

Intervention for Weaning

About 80% of patients admitted to ICU and mechanically ventilated resume spontaneous breathing quite easily after a few days of ventilation (4). Endotracheal intubation, long-term complications after intubation, the use of

continuous sedation and malnutrition are associated with prolonged mechanical ventilation (4). The 20% of patients who cannot be weaned within a few days are concentrated in specific populations (e.g. COPD).

Several studies have been inconclusive in assessing the best ventilatory technique (either Pressure Support or T-piece trials) to speed up the weaning process (5). More interestingly, recent papers have highlighted the concept of using standardized protocols (therapist driven protocols-TDPs) to wean the patient from mechanical ventilation (6,7). TDPs are a consensus of medical knowledge and opinion that is summarised into a care plan or algorithm with changes in therapy directed by changes in objectively measurable patient's variables. The daily plan of a TDP consists of recording functional activities: initial evaluation will include assessment of the patient and ventilator status and patient-ventilator synchrony. This evaluation is usually performed routinely every day and at each ventilator setting change. The use of TDPs has proven to be effective also when applied in tracheostomised and in difficult to wean COPD patients (8).

Additionally, respiratory muscles training has also been used as a strategy in order to speed weaning in a series of ICU ventilatory-dependent COPD patients (9,10).

Intervention for deconditioning / inactivity

Positioning describes the easiest technique used to prevent bed-lying associated risks (1,2). Specific examples of positioning to be used in the ICU setting include upright positioning to improve lung volumes and decrease the

work of breathing in patients who are being weaned from mechanical ventilation; in particular, prone position improves V'/Q' matching and increases functional residual capacity in patients with ARDS (11,12); side lying with the affected lung uppermost improves V'/Q' matching in patients with unilateral lung disease (13). Among techniques dealing with patient's mobilisation, continuous rotational therapy (CRT) is more rarely applied in the ICUs. It refers to the use of specialized beds that continuously and slowly turn a patient along the longitudinal axis, up to an angle of 60° onto each side, with preset degree and speed of rotation, thus preventing dependent airway closure and atelectasis, pooling and stagnation of pulmonary secretions, and subsequent infection that may result from prolonged immobility (14). In one of the largest studies investigating the use of CRT in the management of critically ill patients,120 patients with sepsis or COPD admitted to a medical ICU were randomly allocated to a group nursed on conventional or periodically oscillating beds for 5 consecutive days (15); a significantly lower incidence of pneumonia was seen in the group that was nursed on the oscillating beds compared with those patients nursed conventionally (9 versus 22%, respectively).

Chest physiotherapy is the most frequently performed intervention in the intensive care areas (3). There are many physiological reasons that a patient in ICU may benefit from physiotherapy treatment; these include mucociliary disfunction, altered lung volumes when patients are mechanically ventilated, increased pulmonary shunt, the effects of neuromuscular weakness on respiratory flows, increased risk of nosocomial pneumonia (1,2). Several techniques (i.e. manual hyperinflation, percussion, vibration, and mechanical in-

exsufflation) are used to facilitate an adequate bronchial drainage in these patients, mainly depending on the patient's compliance and the staff's skills (16). Ntoumenopoulos et al. (17) have recently demonstrated that chest physiotherapy reduced by 31% the incidence of ventilator-associated pneumonia. The use of devices (e.g. PEP mask, flow and volume spirometers) to increase the clearance of bronchial secretions are generally not considered in the early phase of treatment, as these techniques require substantial co-operation from the patient.

The most important aim of training skeletal muscle even in the more compromised patients is to enhance their functional capacity and to decrease the risks associated with the intensive care and the bed rest (2,18,19). The earlier the training programme in these patient is started, the greater its effect is. Indeed, muscle mass and its potential efficiency to perform aerobic exercise decline during a period of inactivity. Loss of strength has been found to be greatest during the first days of immobilization, declining by as much as 40% after the first week (20). Therefore, one of the rehabilitative goals in the ICU patients would be the return of a muscle strength that allows basic daily life-activities (e.g. washing, dressing, cooking, etc.) and the ability to walk without assistance. Anedoctically and/or based on specific experiences, these severely disabled patients may undergo sessions aimed at passively and actively training (lifting light weights or pushing against a resistance) the lower and upper extremities. To date, only two controlled studies reported results on the effects of peripheral muscle retraining in COPD patients recovering from an acute episode of respiratory failure. The first by Nava et al. (21) has shown that a

step-by-step retraining program was associated with a more significant improvement in the patient's exercise capacity and symptoms score as compared to controls. In the second by Porta et al. (22) selective arm training has proved to enhance the effects of usual physiotherapy applied to the upper limbs.

Another novel strategy to improve the skeletal muscle performance is neuromuscular electrical stimulation (NMES). NMES has been recently used by physical therapists as a means to improve muscle performance in severely disabled patients (23,24). This type of passive treatment is characterised by a low-volt stimulation targeted to cause a muscle contraction. With regard to the critical care setting, it has been proved to improve the peripheral muscle strength (25) and to decrease the number of days needed to transfer the patients from bed to chair (26). The major advantage of this technique over conventional exercise training is considered to be the lack of ventilatory stress during passive muscular activity, reflecting the reduced muscle mass involved (27).

Conclusion

Rehabilitation in the ICU aims to enhance the overall patient's functional capacity and to restore the individual's physical independence, particularly for those patients still presenting ventilatory dependence upon admission.

The earlier rehabilitation can begin, the greater the potential to reverse the effects of immobility and prolonged bed rest.

To date only strong recommendations can be made regarding weaning

strategies. Evidence supporting physiotherapy treatments is limited due to the lack of long term outcome studies. Despite most of other techniques (e.g. postures, limb exercise and percussion/vibration) need to be further studied and confirmed on a wider population, early physiotherapy may be effectively applied in ICUs.

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Table 1

Rehabilitation processes applied to patients in ICU [*****]

Activity	Technique
Weaning	Therapist Driven Protocols Respiratory muscle training
Mobilisation	Postures Passive and Active limb exercise Continuous Rotational Therapy (CRT)
Chest physiotherapy	Manual Hyperinflation Percusssion / Vibration Mechanical in-exsufflation
Skeletal muscle retraining	Limb muscle training Neuromuscular electrical stimulation (NMES)

**** adapted and modified from ref. n°2***